COMPARISON OF CHRYSOGEN® FORMULATIONS FOR CONTROL OF SOYBEAN LOOPER

C. Rice
G.M. Lorenz
B.C. Thrash
N.R. Bateman
S.G. Felts
W.A. Plummer
M. Mann
J. Schaffer
C.A. Floyd
T. Newkirk
A. Whitfield
Z. Murray
T. Harris
University of Arkansas
Lonoke, AR
B. Catchot
Mississippi State University
Starkville, MS

Abstract

Synthetic insecticides are the most common and reliable control method for soybean looper, *Chrysodeixis includens*. As resistance to synthetic insecticides in soybean looper increases, growers are seeking new control options that are both cost-effective and efficacious. Chrysogen is a biocontrol insecticide, once ingested production of additional viral components occurs within the host. Upon mortality of host, rupturing of individual spreads liquified virus into uncontaminated regions. Multiple experiments were conducted in 2021 at the University of Arkansas Lonoke Research and Extension Center to evaluate the efficacy of Chrysogen formulations on 3rd instar soybean loopers in a leaf dip bioassay and an additional field experiment was conducted in Tillar, AR.

The leaf dip bioassay was conducted using Chrysogen rates, 2.5 ($5.5x10^{11}$ OB), 3 ($6.6x10^{11}$ OB), 3.5 ($7.7x10^{11}$ OB), 4 ($8.8x10^{11}$ OB) oz/ac. Each rate was evaluated daily for leaf area consumed and mortality. Chrysogen caused mortality to occur between 4 and 7 DAT, and all Chrysogen treatments exceeded 75% mortality at 7 DAT. At 6 and 7 DAT, all Chrysogen formulations reduced leaf area consumption when compared to UTC. The field experiment consisted of purified Chrysogen treatments (2, 4 oz/ac), Intrepid Edge (6 oz/ac), and UTC. At 7 and 10 DAT, Intrepid Edge had lower looper densities when compared to the UTC and purified Chrysogen treatments. At 14 DAT fewer larvae were observed in the purified Chrysogen treatments when compared to UTC and Intrepid Edge. No differences in leaf area index were observed between treatments at any sample date. These studies will help aid Arkansas soybean producers to determine the utility, recommended dosage, and control expectation for Chrysogen on soybean looper.

Introduction

Among row crops planted in the United States, Soybean is ranked second in terms of acres planted, with a total of 87.2 million acres in 2021. Soybean looper (*Chrysodeixis includens*) is a major yield limiting pest in late season soybean production. In 2020, ~ 65% of Arkansas soybean acres were infested with only 20% receiving a treatment. Infested acres resulted in a 9.6% loss + cost with one insecticide application averaging $17.50. Increased resistance to synthetic insecticides has caused researchers to find an alternative biological control method for soybean looper. The objective of this study was to determine if Chrysogen could be a more effective and cost-efficient option for soybean looper control.

Material and Methods

Leaf Dip Bio-Assay

A study was conducted at the University of Arkansas Lonoke Research and Extension Center using 3rd instar larvae to evaluate multiple formulations of Chrysogen. Trial size consisted of 4 treatments (UTC, Commercial Chrysogen, Purified formulation #1, Purified formulation #2) applied at 2 oz/ac with 30 replications per treatment. Leaf disks (1

½ in) were punched from vegetative soybeans (Asgrow 46x6) and dipped into Chrysogen treatments. Chrysogen treatments were allowed to air dry before placement of one soybean looper per petri dish. Treatments were maintained in insect incubator at 14:10 Light:Dark ratio and 85°F:78°F, respectively. All treatments were evaluated daily up to 14 DAT for percent defoliation and mortality. Defoliation percentages were obtained from LeafByte.

Field Study

A field study was conducted in Tiller, AR consisting of 4 treatments (UTC, Intrepid Edge 6oz, Chrysogen 2oz, Chrysogen 4oz) with 4 replications per treatment to evaluate soybean looper efficacy. Soybean looper density was collected twice per plot using a standard black shake sheet. LAI-2200I was used to correlate defoliation with LAI (Leaf Area Index). All treatments were evaluated at 7, 10, 14 DAT for SBL density and LAI readings.

Results

Leaf Dip Bio-Assay

No differences were observed in consumed leaf area prior to 6 DAT for all treatments (Figure 1). At 6 and 7 DAT, all Chrysogen formulations significantly reduced consumed leaf area when compared to UTC (Figure 1). Chrysogen Formulation #2 at 4 DAT was the only treatment to significantly increase mortality when compared to all other treatments (Figure 2). All Chrysogen formulations increased mortality when compared to UTC, with formulation #2 having the highest mortality out of all formulations at 5-7 DAT (Figure 2). At 7 DAT, all Chrysogen treatments had higher mortality than the UTC butwere not different from one another (Figure 2).

Field Study

Intrepid Edge reduced SBL densities when compared to UTC and Chrysogen treatments at 7 and 10 DAT (Figure 3). Reduction in SBL density was observed for all rates of Chrysogen formulation #2 when compared to UTC and Intrepid Edge at 14 DAT (Figure 3). No difference was observed in LAI readings for all days of observation (Figure 4).

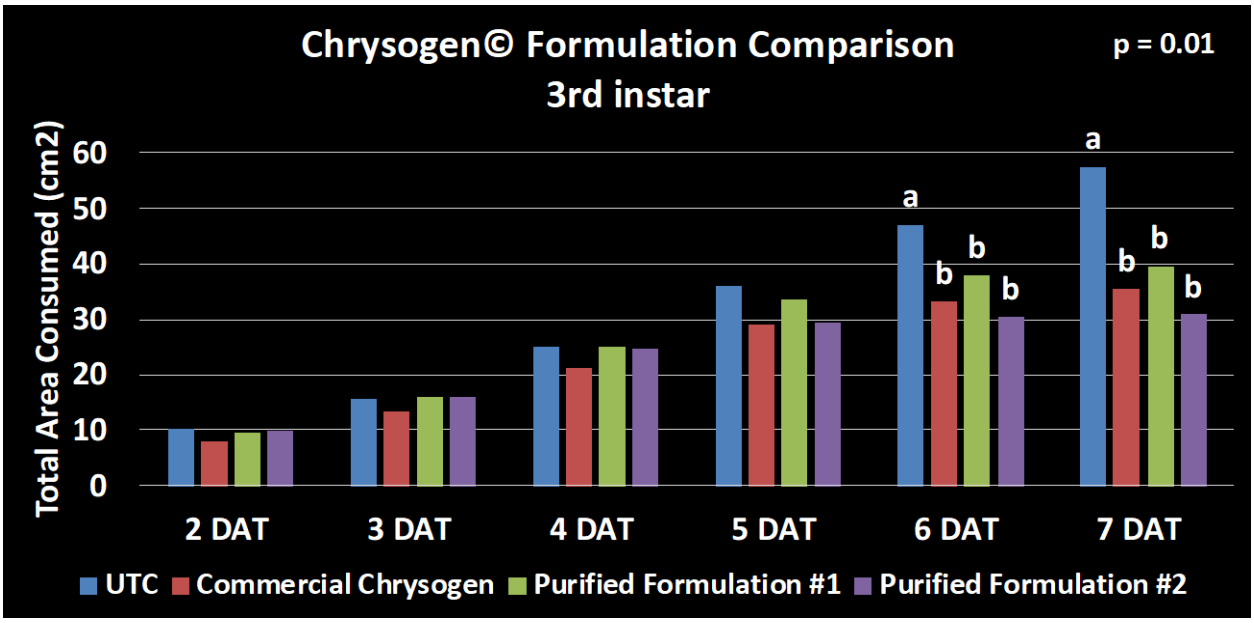

Figure 1: Total Soybean Leaf Area Consumed for Chrysogen Formulation Comparison Study Using a Leaf Dip Assay.

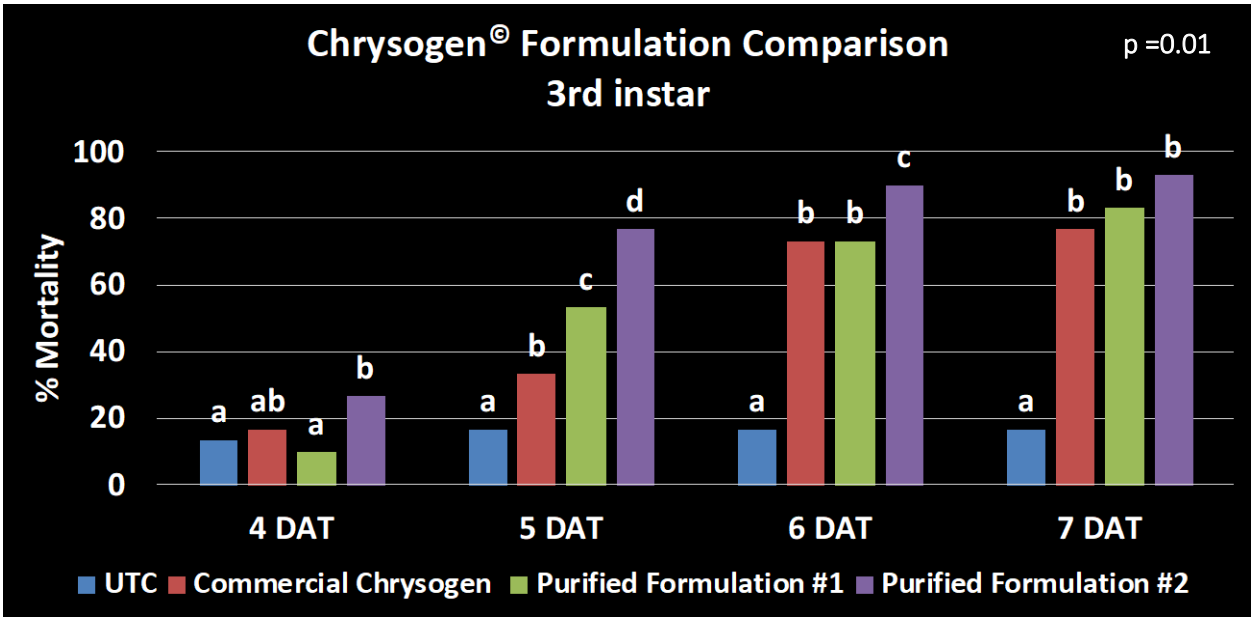

Figure 2: Percent Mortality for Chrysogen Formulation Comparison Study Using a Leaf Dip Assay.

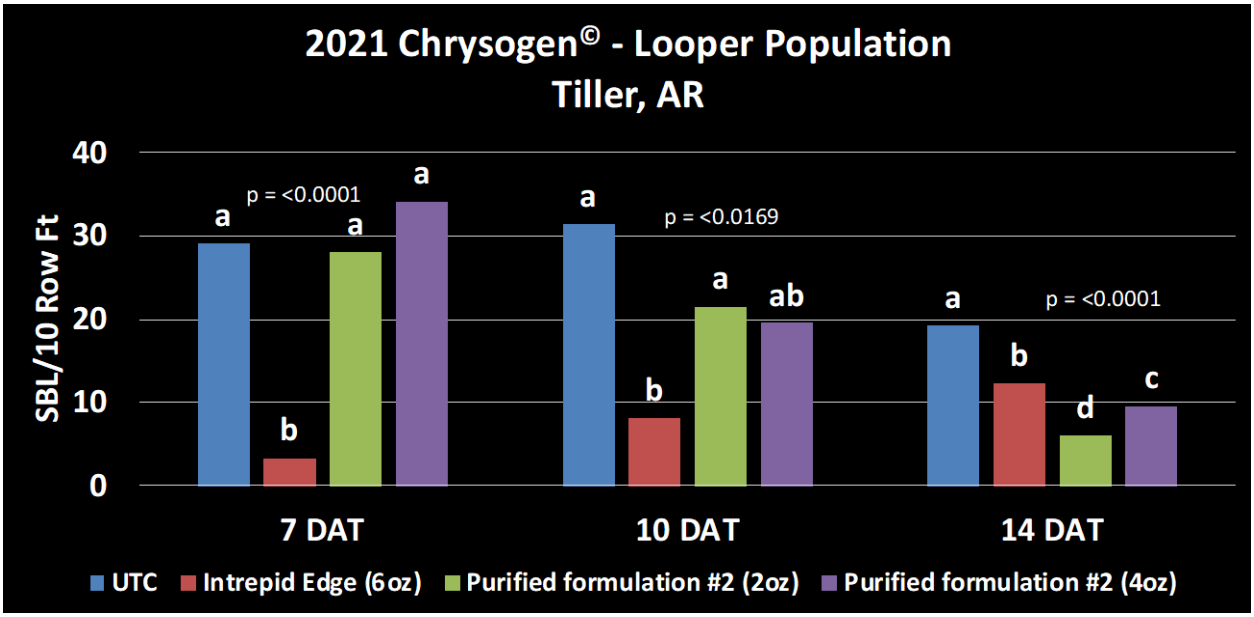

Figure 3. Soybean looper (SBL) Density for 2021 Chrysogen Field Trial conducted in Tiller,AR

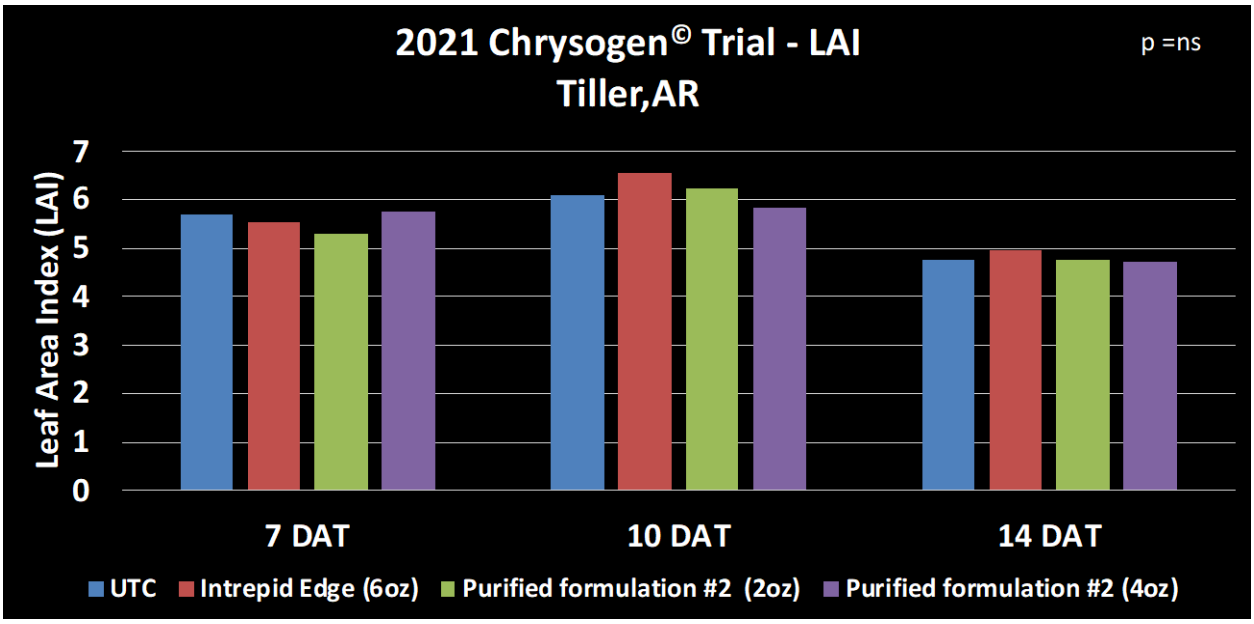

Figure 4. Leaf Area Index (LAI) Readings for 2021 Chrysogen Field Trial conducted in Tiller,AR

Summary

Quicker mortality was observed in the leaf – dip assay with purified formulation #2 when compared to all other treatments. In the field study, soybean looper control occurred between 10-14 DAT with purified formulation #2. Best control is provided when applications of Chrysogen are applied to 3rd instar or less.

Acknowledgments

I would like to acknowledge AgBiTech, Arkansas Extension Entomology Crew, graduate students, and student workers that made this research possible.

References

Musser, F. R.* , A. L. Catchot, Jr. , S. P. Conley , J. A. Davis , C. DiFonzo , J. K. Greene. et al. (2020) *2020 Soybean Insect Losses in the United States*

Studebaker, G., Bateman, N., Davis, J., Hopkins, J., Thrash, B., & Lee, J. et al. (2021). *2021 insecticide recommendations for Arkansas*. [Little Rock, Ark.]: Cooperative Extension Service, University of Arkansas, Division of Agriculture.

USDA NASS. 2021. NASS-Mississippi Reports and Statistics,http://www.nass.usda.gov/Statistics_by_State/Mississippi/index.asp.